

**CLAIMS:**

- 1        1.        A method for performing passive voltage contrast on a silicon on insulator  
2        (SOI) device comprising the steps of:  
3                grinding a first portion of a substrate of said SOI device with a dimpling tool;  
4                etching a second portion of said substrate of said SOI device with  
5        tetramethylammonium hydroxide (TMAH) following said grinding of said SOI  
6        device with said dimpling tool;  
7                etching a third portion of said substrate and a portion of a box insulator of said  
8        SOI device with hydrofluoric acid (HF) following said etching of said SOI device  
9        with said TMAH;  
10               applying a conductive coating to said etched portions of said substrate and  
11        said box insulator of said SOI device;  
12               applying said conductive coating to a portion of a body of said SOI device;  
13        and  
14               directing a beam of electrons at said SOI device to detect a secondary  
15        emission from said SOI device.
- 1        2.        The method as recited in claim 1, wherein said beam of electrons is directed at  
2        a gate oxide area on said SOI device.
- 1        3.        The method as recited in claim 2, wherein if said secondary emission results  
2        in said gate oxide area appearing bright then a breakdown in said gate oxide of said  
3        SOI device is indicated.
- 1        4.        The method as recited in claim 2, wherein if said secondary emission results  
2        in said gate oxide area appearing dark then a breakdown in said gate oxide of said  
3        SOI device is not indicated.

- 1        5.        The method as recited in claim 1, wherein said etching of said SOI device  
2        with said HF stops at a body of said SOI device.
- 1        6.        The method as recited in claim 1 further comprising the step of:  
2        polishing said SOI device to a first metal layer.
- 1        7.        The method as recited in claim 6 further comprising the step of:  
2        gluing a dummy integrated circuit to a top surface of said SOI device.
- 1        8.        The method as recited in claim 7 further comprising the step of:  
2        removing said dummy integrated circuit following etching said SOI device  
3        with said HF.
- 1        9.        The method as recited in claim 1, wherein said conductive coating comprises  
2        a carbon ink coating.

- 1      10.    A silicon on insulator (SOI) device, comprising:  
2            a substrate, wherein a first portion of said substrate is ground using a dimpling  
3            tool, wherein a second portion of said substrate is etched using tetramethylammonium  
4            hydroxide (TMAH), wherein a third portion of said substrate is etched using  
5            hydrofluoric (HF) acid;  
6            a box insulator overlaying said substrate, wherein a portion of said box  
7            insulator is etched using said HF acid;  
8            a body overlaying said box insulator; and  
9            a polysilicon gate separated from said body by a gate oxide;  
10           wherein a beam of electrons is directed at an area of said gate oxide to  
11           determine if there is a breakdown in said gate oxide.
- 1      11.    The SOI device as recited in claim 10, wherein said beam of electrons is  
2           directed at said gate oxide area to detect a secondary emission from said SOI device.
- 1      12.    The SOI device as recited in claim 11, wherein if said secondary emission  
2           results in said gate oxide area appearing bright then a breakdown in said gate oxide of  
3           said SOI device is detected.
- 1      13.    The SOI device as recited in claim 11, wherein if said secondary emission  
2           results in said gate oxide area appearing dark then a breakdown in said gate oxide of  
3           said SOI device is not detected.
- 1      14.    The SOI device as recited in claim 10, wherein said body is not etched using  
2           said HF.
- 1      15.    The SOI device as recited in claim 10, wherein a conductive coating is applied  
2           to said etched portions of said substrate and said box insulator of said SOI device and  
3           applied to a portion of said body of said SOI device.

- 1      16.    A silicon on insulator (SOI) device, comprising:  
2            a substrate, wherein a first portion of said substrate is ground using a dimpling  
3            tool, wherein a second portion of said substrate is etched using tetramethylammonium  
4            hydroxide (TMAH), wherein a third portion of said substrate is etched using  
5            hydrofluoric (HF) acid;  
6            a box insulator overlaying said substrate, wherein a portion of said box  
7            insulator is etched using said HF acid;  
8            a body overlaying said box insulator; and  
9            a contact interconnecting said body to a metal layer;  
10          wherein a beam of electrons is directed at an area of said contact to determine  
11          if said contact is open.
- 1      17.    The SOI device as recited in claim 16, wherein said beam of electrons is  
2          directed at said contact area to detect a secondary emission from said SOI device.
- 1      18.    The SOI device as recited in claim 17, wherein if said secondary emission  
2          results in said contact area appearing bright then a closed contact is detected.
- 1      19.    The SOI device as recited in claim 17, wherein if said secondary emission  
2          results in said contact area appearing dark then an open contact is detected.
- 1      20.    The SOI device as recited in claim 16, wherein said body is not etched using  
2          said HF.
- 1      21.    The SOI device as recited in claim 16, wherein a conductive coating is applied  
2          to said etched portions of said substrate and said box insulator of said SOI device and  
3          applied to a portion of said body of said SOI device.

- 1       22.    A method for making a silicon on insulator (SOI) device suitable for  
2       performing passive voltage contrast comprising the steps of:  
3               grinding a first portion of a substrate of said SOI device with a dimpling tool;  
4               etching a second portion of said substrate of said SOI device with  
5       tetramethylammonium hydroxide (TMAH) following said grinding of said SOI  
6       device with said dimpling tool;  
7               etching a third portion of said substrate and a portion of a box insulator of said  
8       SOI device with hydrofluoric acid (HF) following said etching of said SOI device  
9       with said TMAH;  
10              applying a conductive coating to said etched portions of said substrate and  
11       said box insulator of said SOI device; and  
12              applying said conductive coating to a portion of a body of said SOI device.